## DETAILED ACTION

### *Continued Examination Under 37 CFR 1.114*

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on July 26, 2010 has been entered.

### *Response to Amendment*

2. In response to the amendment received on July 26, 2010:

- claims 7-13 are presently pending
- all prior art rejections are withdrawn in light of the amendments to the claims
- new grounds of rejection are presented below

### *Claim Objections*

3. Claims 7-13 are objected to because of the following informalities. Specifically, independent claims 7 and 13 each contain a final limitation that requires the electrolyzed solutions to result in the production of a manganese product having 99.9% purity; however, the specific wording of the limitation states the solutions “are obtained having which produce manganese” (see claim 7 and 13 at the last two lines of the

respective claims). It is suggested that this phrase be rewritten in idiomatic English. Appropriate correction is required.

### *Claim Rejections - 35 USC § 103*

The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

4. Claims 7-12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Carosella (U.S. Pat. No. 2,766,197) (hereinafter referred to as “CAROSELLA”) in view of Globus (U.S. Pat. No. 3,106,451) (hereinafter referred to as "GLOBUS”) and Schowalter et al., (U.S. Pat. No. 3,905,805) (hereinafter referred to as “SCHOWALTER”) with evidence from Francis et al., (U.S. 2,277,663) (hereinafter referred to as “FRANCIS”) and Lindkvist et al., (U.S. Pat. No. 5,286,274) (hereinafter referred to as “LINDKVIST”).

Regarding claim 7, CAROSELLA teaches a method of obtaining electrolytic manganese from ferroalloy manufacturing waste having manganese (see col. 1 lines 49-68 teaching the manganese slag as a manufacturing by-product having manganese) comprising:

- an initial treatment of the manganese oxides (see col. 2 lines 27-30);

- a hydrometallurgical phase comprising the steps of lixiviation (see col. 2 lines 31-37), primary purification (see col. 2 lines 51-60), secondary purification (see col. 2 lines 60-65) and conditioning (see col. 2 lines 65-69); and
- an electrolysis phase (see col. 3 lines 3-6).

Additionally, CAROSELLA teaches the method for processing manganese-bearing waste material (see col. 1 lines 59-68 teaching the use of manganese containing slags as a source material for the process), the purification steps to remove impurities consisting primarily of iron and aluminum being caused by pH control (see col. 2 lines 51-59), the removal of base metal impurities such as zinc being caused by the precipitation of the metal with sulfur (see col. 2 lines 51-59) and the production of a manganese metal product that is 99.9% pure (see col. 3 lines 3-6; col. 4 lines 20-23).

CAROSELLA, however, does not explicitly teach: (1) the initial treatment of the manganese oxides being an initial sulphation phase with the sulphation phase being a thermal process with near stoichiometric acid consumption and (2) the process being employed for treating sludge formed from the exhaust gases from a silicoalloy or ferroalloy production furnace.

However, GLOBUS teaches a process for obtaining electrolytic manganese where the initial treatment is an initial sulphation phase which is a thermal process with near stoichiometric acid consumption (see col. 1 line 59-col. 2 line 11 teaching the addition of sulfuric acid with the manganese oxides in a near stoichiometric amount in an exothermic process, i.e. thermal).

Moreover, one of ordinary skill in the art would have been motivated to combine the manganese sulphation steps of GLOBUS with the manganese production method of CAROSELLA because GLOBUS teaches the process being particularly suited for the treatment of low concentration manganese ore (see col. 1 lines 39-44). Furthermore, CAROSELLA teaches the use of waste slags generated from the production of ferromanganese having a manganese concentration within the range of GLOBUS (see col. 2 lines 7-21 teaching the waste slag from the production of ferromanganese having a manganese content of greater than 20% by weight). Thus, one of ordinary skill would have understood that the benefits of GLOBUS could also be applied to other low concentration manganese extractions such as in the treatment of manganese containing slags as taught by CAROSELLA.

Furthermore, CAROSELLA as modified by GLOBUS does not explicitly teach the waste produced being half that of the original and being self compactable. However, since CAROSELLA as modified by GLOBUS teaches all of the same method steps, one of ordinary skill in the art would expect that the same waste products to be produced. Additionally, CAROSELLA teaches the formation of the same byproducts, i.e. ferric hydroxide, base metal sulfides and sulfuric acid. Consequently, the waste produced would be expected to be of a similar amount and have similar properties.

Therefore, it would have been obvious to one of ordinary skill in the art at the time of invention to combine the initial sulphation phase of GLOBUS with the method of CAROSELLA in order to obtain a method as claimed.

Additionally, SCHOWALTER teaches that it is known in the art to collect and recycle the particles that are giving off from the furnaces in various ferroalloy processing (see col. 1 lines 14-38). Moreover, SCHOWALTER teaches that these particles contain a large amount of manganese that has in the past been discarded and wasted (see col. 1 lines 5-13). As a result, one of ordinary skill in the art would have appreciated the benefit of reclaiming the manganese exiting the furnace and would have been motivated to reduce the loss of manganese resulting from the ferroalloy processing by using the particulate matter collected.

Furthermore, SCHOWALTER teaches the composition of the particulates or dust resulting from the exhaust gases including Mn, Fe, Al, Ca, K, Mg and Na (col. 1 lines 28-38). Additionally, as evidenced by FRANCIS, the particles or dust expelled from a ferromanganese furnace is described as including predominately oxides of Mn, Al, Fe, Ca, Mg, Na, K and Si (see col. 2 lines 22-43).

Moreover, CAROSELLA teaches the manganese bearing slag including oxides of Mn, Fe, Si, Al (see col. 3 lines 67-69), but also teaches the use of the process for the electrolytic production of manganese from manganese bearing materials (see col. 1 lines 15-19). LINDKVIST further evidences another manganese slag resulting from the production of a ferroalloy wherein the slag comprised oxides of Mn, Ca, Al, Si and Mg (see col. 3 lines 49-51). Consequently, the composition of the manganese bearing slags for which the method of CAROSELLA would have been applied would have been recognized to have varied to some degree.

Also, the close similarities between the chemical composition and make-up of the manganese bearing slags and the particles collected from the exhaust gases, would have led one of ordinary skill in the art to consider the method of CAROSELLA, suitable for treating the manganese bearing slags, suitable for treating the particulate material collected from the exhaust gases. Moreover, one of ordinary skill in the art would have been motivated to apply the method of CAROSELLA to the particle material collected from the exhaust gases because doing so would allow for the reclamation of the unused manganese.

The use of a known technique to improve similar devices (methods or products) in the same way is likely to be obvious. See *KSR Int'l Co. v. Teleflex Inc.*, 82 USPQ2d 1385, 1395–97 (2007) (see MPEP § 2143, C.).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of invention to employ the method of CAROSELLA as modified by GLOBUS to recover the manganese from the particles collected from the exhaust gases from the ferroalloy furnaces of SCHOWALTER since doing so would allow for the recovery of the manganese.

Regarding claim 8, GLOBUS teaches the method of obtaining electrolytic manganese from ferroalloy manufacturing waste or any other industrial waste having manganese wherein the sulphation phase is carried out in a furnace in which exothermic reactions occur inside the furnace on poly-tetrafluoroethylene ("PTFE") trays generating $SO_2$ gases (see col. 1 lines 59-72; col. 2 lines 9-11).

Additionally, although GLOBUS does not teach the furnace having PTFE trays it is well known in the art to use PTFE or TEFLON coated trays in furnaces as a non-reactive coating. Consequently, it would have been readily obvious to one of ordinary skill in the art to use PTFE coated trays in the furnace of GLOBUS during the sulphation phase.

Regarding claim 9, CAROSELLA teaches the method of obtaining electrolytic manganese from ferroalloy manufacturing waste or any other industrial waste having manganese wherein the lixiviation step is carried out with the anolyte from the electrolysis cell (see col. 2 lines 31-36).

Regarding claim 10, CAROSELLA teaches the method of obtaining electrolytic manganese from ferroalloy manufacturing waste or any other industrial waste having manganese wherein the lixiviation step is performed while strongly stirring in the reactor coated with an antacid (see col. 2 lines 31-35 teaching the leaching with sulfuric acid, which one of ordinary skill in the art would have understood to require stirring in the leaching vessel in order to ensure that as much of the manganese as possible is removed by the lixiviant).

However, although CAROSELLA does not explicitly teach the leaching vessel having such a lining, it is well known in the art to have an acid-resistant lining especially when the leaching is to be done by an acid leaching process. Consequently, it would

have been obvious to one of ordinary skill in the art to use a leaching vessel or tank having an acid-resistant lining as claimed.

Regarding claim 11, CAROSELLA teaches the method of obtaining electrolytic manganese from ferroalloy manufacturing waste or any other industrial waste having manganese wherein the primary filtration step is carried out in the same reactor as the lixiviation by raising the pH of the pulp to near neutral levels and then subjecting the pulp to filtering in a filter press and washing with water thereby obtaining an inert waste (see col. 2 lines 51-56 and the figure teaching the raising of the pH to near neutral levels and then filtering with a filter press with subsequent washing of the filtrate or pulp with water).

Regarding claim 12, CAROSELLA teaches the method of obtaining electrolytic manganese from ferroalloy manufacturing waste or any other industrial waste having manganese wherein the washing water of the pulp can be reused successive times to concentrate the manganese therein (see col. 2 lines 51-56; see also discussion above regarding the earlier claims as to the cited prior art meeting all of the earlier recited limitations).

Please note, the added limitations recite two alternative limitations requiring the use of either one or the other in the claimed process. Furthermore, since the second alternative merely recites that the washing water "can be re-used" and does not require that it be used, the prior art washing water need only be capable of operating in such a

fashion in order to meet the claimed limitations. Here, it would clearly be possible in the modified prior art process for this to be the case. Moreover, it would have been readily obvious to do so since reusing the washing water would have increased the recovery of manganese and since it is readily known to do so when using solvent extraction to obtain higher yields.

5. Claim 13 is rejected under 35 U.S.C. 103(a) as being unpatentable over CAROSELLA in view of GLOBUS.

Regarding claim 13, CAROSELLA teaches a method of obtaining electrolytic manganese from ferroalloy manufacturing waste or any other industrial waste having manganese (see col. 1 lines 49-68 teaching the manganese slag as a manufacturing by-product having manganese as claimed) consisting essentially of:

- an initial treatment of the manganese oxides (see col. 2 lines 27-30);
- a hydrometallurgical phase comprising the steps of lixiviation (see col. 2 lines 31-37), primary purification (see col. 2 lines 51-60), secondary purification (see col. 2 lines 60-65) and conditioning (see col. 2 lines 65-69); and
- an electrolysis phase (see col. 3 lines 3-6).

Additionally, CAROSELLA teaches the method for processing manganese-bearing waste material (see col. 1 lines 59-68 teaching the use of manganese containing slags as a source material for the process), the purification steps to remove impurities consisting primarily of iron and aluminum being caused by pH control (see

col. 2 lines 51-59), the removal of base metal impurities such as zinc being caused by the precipitation of the metal with sulfur (see col. 2 lines 51-59) and the production of a manganese metal product that is 99.9% pure (see col. 3 lines 3-6; col. 4 lines 20-23).

CAROSELLA, however, does not explicitly teach the initial treatment of the manganese oxides being an initial sulphation phase with the sulphation phase being a thermal process with near stoichiometric acid consumption.

However, GLOBUS teaches a process for obtaining electrolytic manganese where the initial treatment is an initial sulphation phase which is a thermal process with near stoichiometric acid consumption (see col. 1 line 59-col. 2 line 11 teaching the addition of sulfuric acid with the manganese oxides in a near stoichiometric amount in an exothermic process, i.e. thermal).

Moreover, one of ordinary skill in the art would have been motivated to combine the manganese sulphation steps of GLOBUS with the manganese production method of CAROSELLA because GLOBUS teaches the process being particularly suited for the treatment of low concentration manganese ore (see col. 1 lines 39-44). Furthermore, CAROSELLA teaches the use of waste slags generated from the production of ferromanganese having a manganese concentration within the range of GLOBUS (see col. 2 lines 7-21 teaching the waste slag from the production of ferromanganese having a manganese content of greater than 20% by weight). Thus, one of ordinary skill would have understood that the benefits of GLOBUS could also be applied to other low concentration manganese extractions such as in the treatment of manganese containing slags as taught by CAROSELLA.

Furthermore, CAROSELLA as modified by GLOBUS does not explicitly teach the waste produced being half that of the original and being self compactable. However, since CAROSELLA as modified by GLOBUS teaches all of the same method steps, one of ordinary skill in the art would expect that the same waste products to be produced. Additionally, CAROSELLA teaches the formation of the same byproducts, i.e. ferric hydroxide, base metal sulfides and sulfuric acid. Consequently, the waste produced would be expected to be of a similar amount and have similar properties.

Therefore, it would have been obvious to one of ordinary skill in the art at the time of invention to combine the initial sulphation phase of GLOBUS with the method of CAROSELLA in order to obtain a method as claimed.

Please note, with regards to interpretation of the claim due to the use of the "consisting essentially of" transitional phrase, the Examiner is interpreting the claim in accordance with section 2111.03 of the MPEP. As such, the scope of the claim is limited to the specified steps and those that do not materially affect the basic and novel characteristics of the claimed invention. Additionally, the Examiner notes that it appears that the novel and basic characteristics of the claimed invention is that the resulting product, i.e. the manganese, is obtained with a purity of 99.9% (see last two lines of claim 13. Therefore, the claim is being interpreted to only preclude those steps which result in the purity being lower than 99.9%.

### *Response to Arguments*

6. Applicant's arguments with respect to claims 7-13 have been considered but are moot in view of the new ground(s) of rejection.

### *Conclusion*

7. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

1) U.S. Pat. No. 4,526,678 to Myhren et al., teaching an apparatus and method for separating large and small particles suspended in a gas stream including particles from an exhaust gas from ferroalloy furnaces.
2) U.S. Pat. No. 2,259,418 to Hannay et al., teaching an electrolytic manganese production process including a leaching step and a purification step and a crystallization step.
3) U.S. Pat. No. 2,392,385 to Hunter teaching a process for the purification of manganese electrolytes including generally a leaching step, a first purification step, a second purification step and an electrolysis step.

8. Any inquiry concerning this communication or earlier communications from the examiner should be directed to BRYAN D. RIPA whose telephone number is (571)270-7875. The examiner can normally be reached on Monday to Friday, 9:00 AM to 5:00 PM EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Alexa Neckel can be reached on 571-272-1446. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Harry D Wilkins, III/
Primary Examiner, Art Unit 1723

/B. D. R./
Examiner, Art Unit 1723